Welcome to GENI

Global Environment for Network Innovations

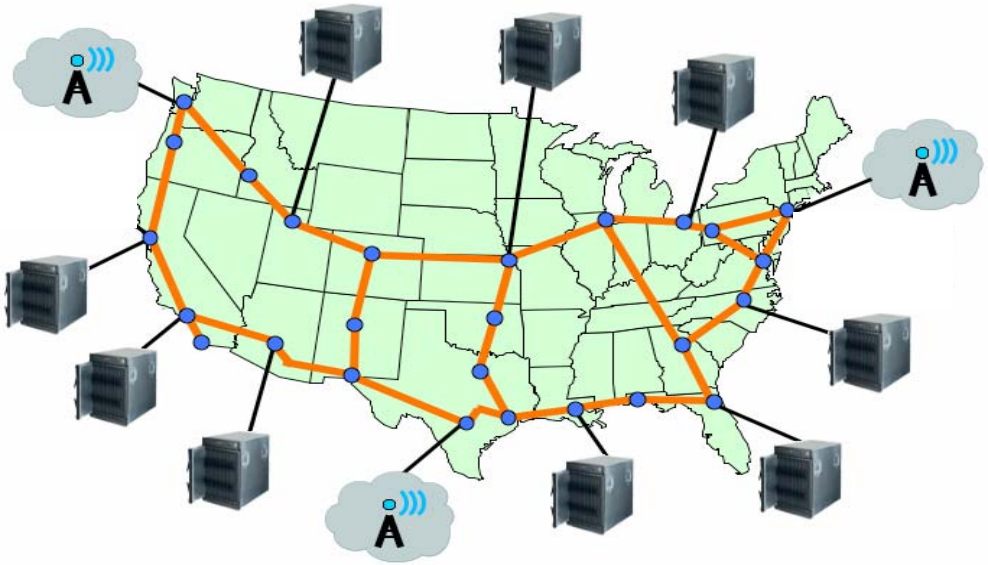
The GENI Project Office (GPO)

www.geni.net

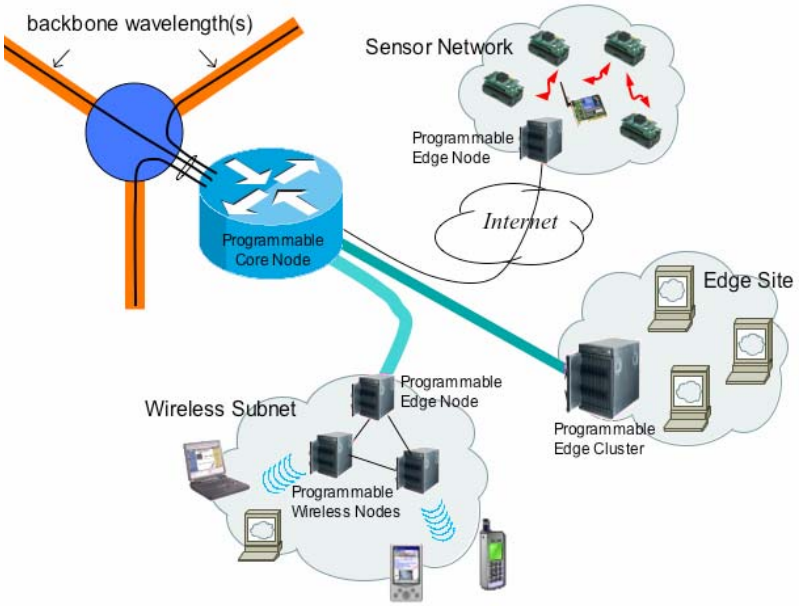
Clearing house for all GENI news and documents

The GENI Vision

A national facility to explore radical designs for a future global networking infrastructure



- Large, wide-area footprint
- Enables large-scale, end-to-end experiments
- Shared among researchers by virtualization & slices



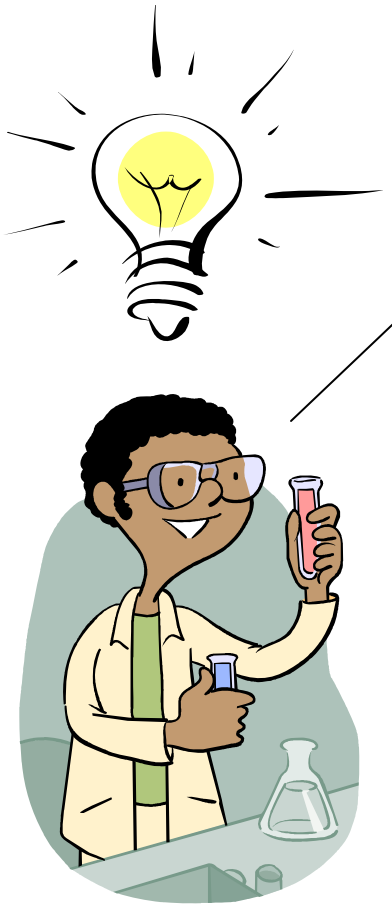
- Current / projected substrates
- High capacity optical nets and programmable cores
- Large clusters of CPUs, storage
- Edge / access technologies (e.g. cellular, sensor networks)

How We'll Use GENI

Note that this is the "classics illustrated" version – a comic book!

Please read the GENI Research and Education Plan to learn all about the community's vision for GENI and the research it will enable. Your suggestions are very much appreciated!

A bright idea

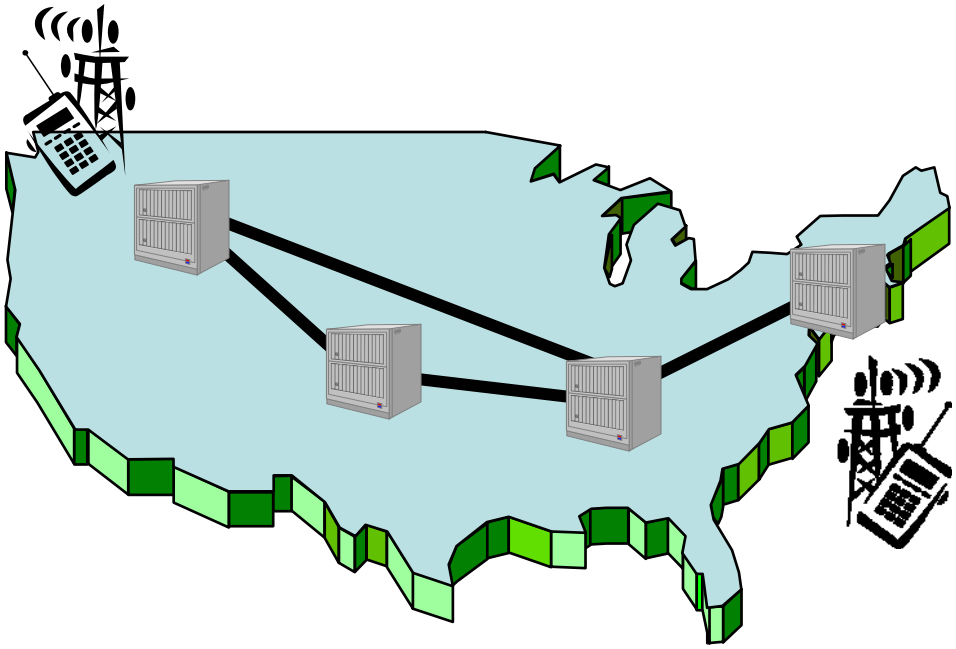


I have a great idea! The original Internet architecture was designed to connect one computer to another – but a better architecture would be fundamentally based on PEOPLE and CONTENT!

That will never work! It won't scale! What about security? It's impossible to implement or operate! Show me!

Trying it out

My new architecture worked great in the lab, so now I'm going to try a larger experiment for a few months.



He uses a modest slice of GENI, sharing the facility with many other concurrent experiments.

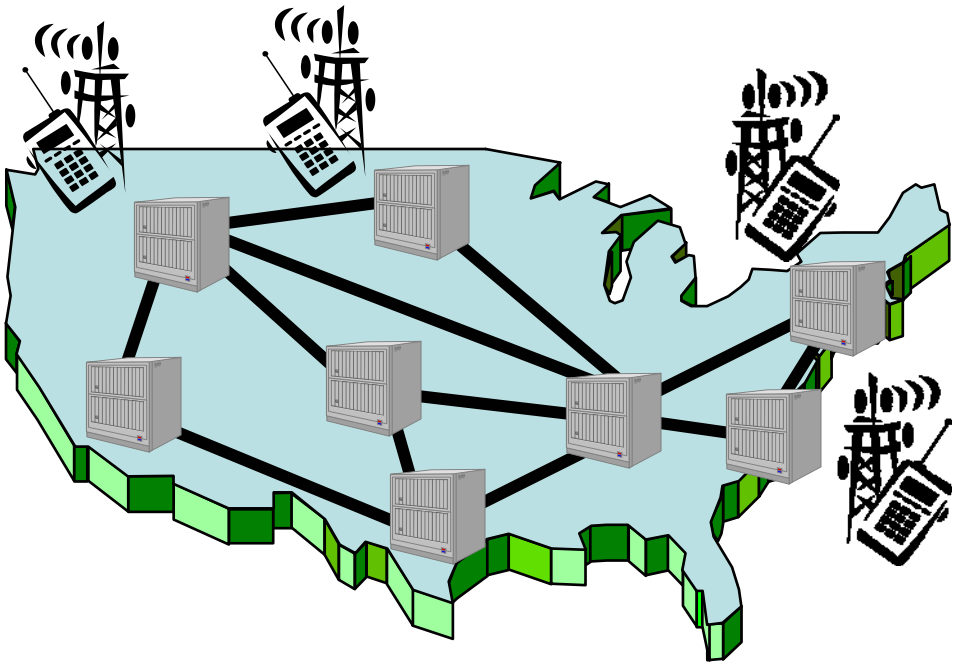
And so he poured his experimental software into clusters of CPUs and disks, bulk data transfer devices ('routers'), and wireless access devices throughout the GENI facility, and started taking measurements . . .

It turns into a really good idea

Boy did I learn a lot! I've published papers, the architecture has evolved in major ways, and I'm even attracting real users!

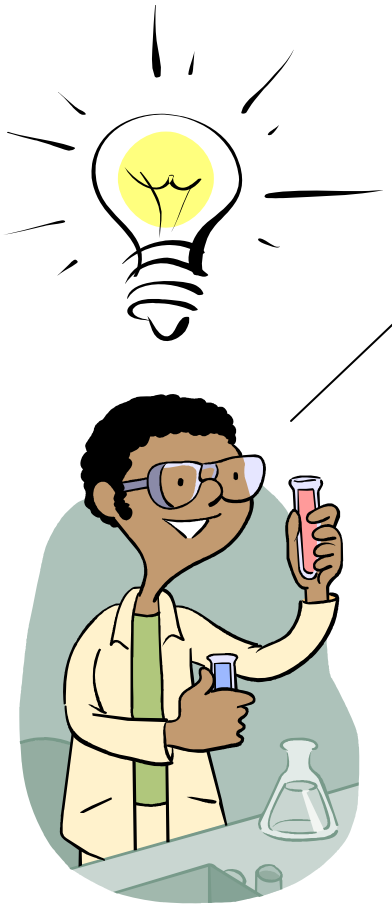
Location-based social networks are really cool!

His experiment grew larger and continued to evolve as more and more real users opted in . . .



His slice of GENI keeps growing, but GENI is still running many other concurrent experiments.

Experiment turns into reality



My experiment was a real success, and my architecture turned out to be mostly compatible with today's Internet after all – so I'm taking it off GENI and spinning it out as a real company.

I always said it was a good idea, but way too conservative.

Meanwhile . . .

I have a great idea! If the Internet were augmented with a scalable control plane and realtime measurement tools, it could be 100x as reliable as it is today . . . !

And I have a great concept for incorporating live sensor feeds into our daily lives !

If **you** have a great idea, check out the **NSF FIND, SING, or NGNI** programs which are funding new architectural work. www.nets-find.net

Moral of this story

- GENI is meant to enable . . .
  - Trials of new architectures, which may or may not be compatible with today's Internet
  - Long-running, realistic experiments with enough instrumentation to provide real insights and data
  - 'Opt in' for real users into long-running experiments
  - Large-scale growth for successful experiments, so good ideas can be shaken down at scale
- A reminder . . .
  - GENI itself is not an experiment !
  - GENI is a stable facility on which experiments run

GENI creates a huge opportunity for ambitious research!

How We'll Build GENI

Note that this is the "classics illustrated" version – a comic book!

Please read the GENI Project Development Plan (PDP) and Project Execution Plan (PEP) for detailed planning information.

An ambitious goal

The GENI facility will allow experiments to incorporate **all the key technologies for global networks and distributed services within a 10-20 year time frame** – specifically CPU & disk farms, programmable 'routers', optical networks, and wireless access.

That's <u>way</u> too ambitious!

Exactly what wireless? or optics?

Technology becomes obsolete fast!

Overlays are all you'll ever need!

Nobody will use it – it's a white elephant!

Managing real risks

You are identifying important **risks**.

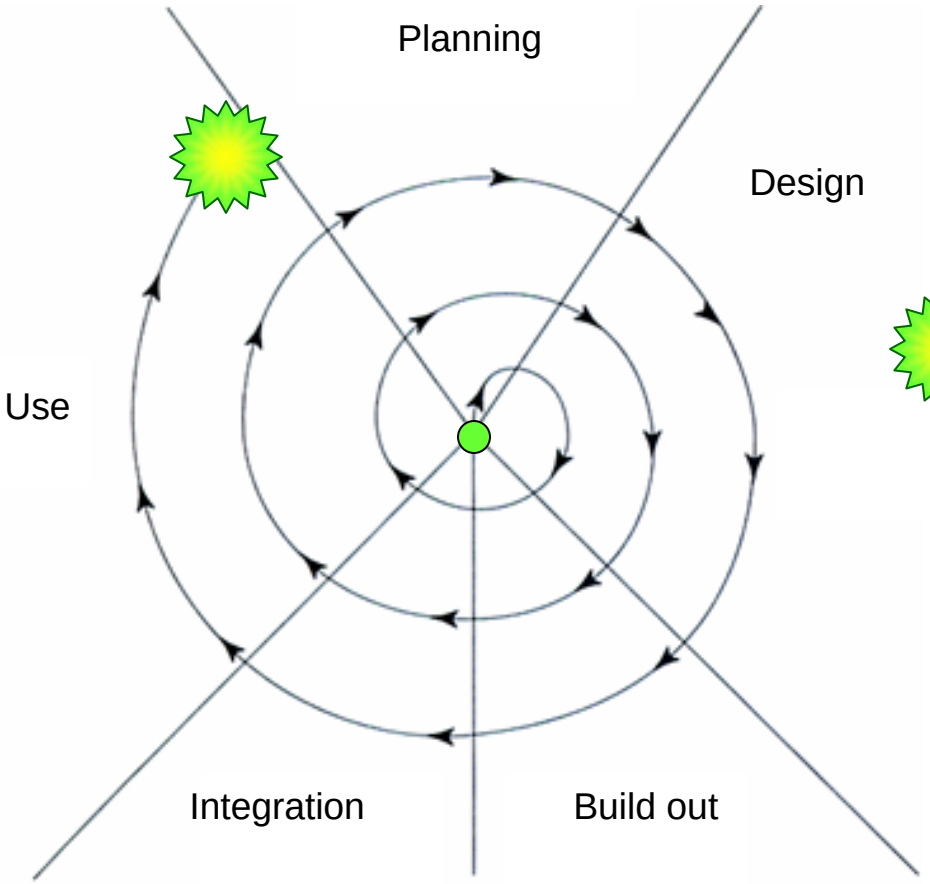
A typical “blueprint then execute” process suitable for building many kinds of predictable engineering projects (such as chemical plants) will lead to extremely high levels of risk if used for planning and building GENI.

Our plan for building GENI successfully relies on two main risk-management techniques:

- **Spiral development**
- **Federation**

Spiral Development

GENI grows through a well-structured, adaptive process

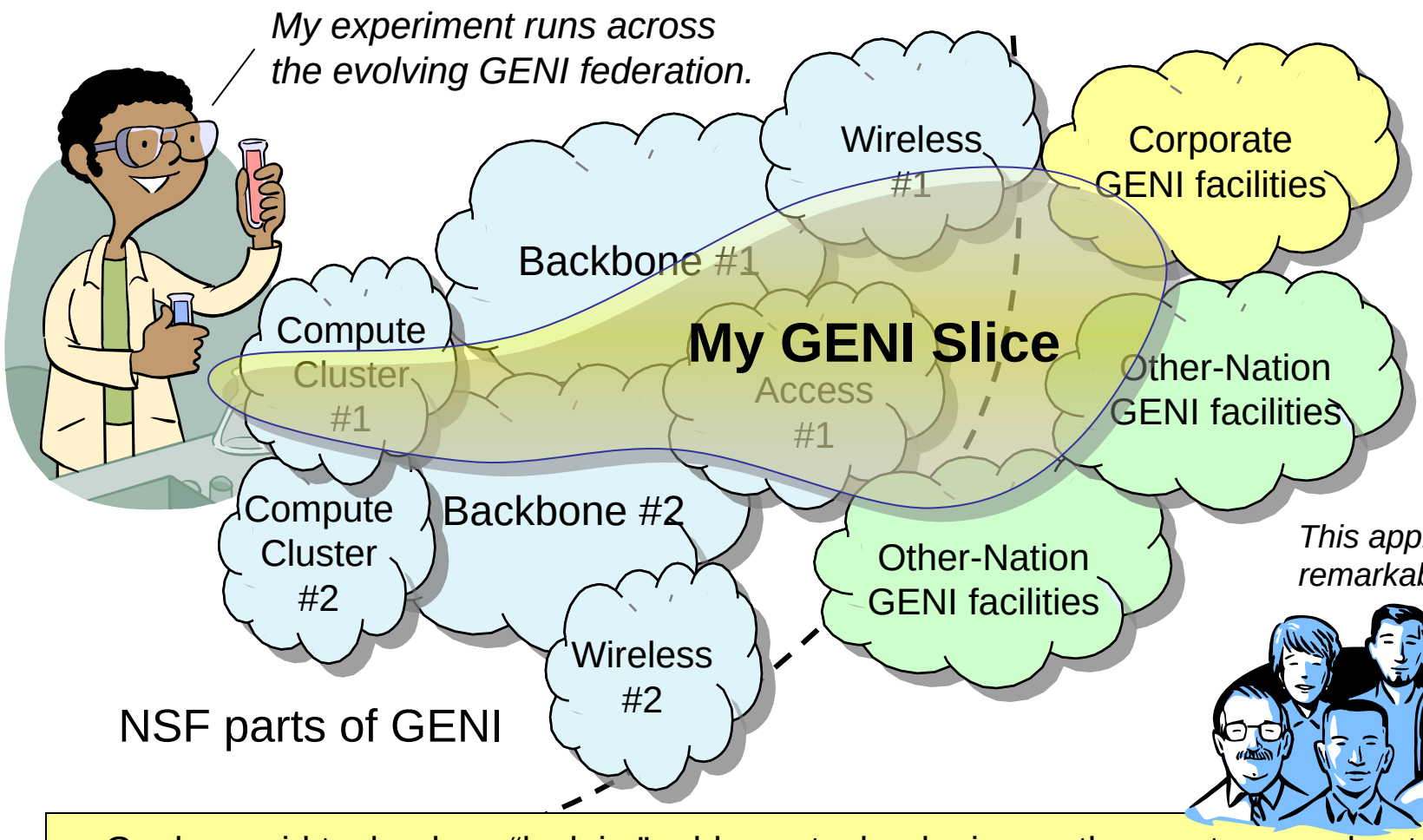


Strawman GENI Construction Plan

- An achievable **starting point**
  Example: Rev 1 “narrow waist”, federation of multiple substrates (clusters, wireless, regional / national optical net with early GENI ‘routers’, perhaps some existing testbeds), Rev 1 user interface and instrumentation.
- Envisioned **ultimate goal**
  Example: Planning Group’s desired GENI facility, probably trimmed some ways and expanded others. Incorporates large-scale distributed computing resources, high-speed backbone nodes, nationwide optical networks, wireless & sensor nets, etc.
- Spiral Development Process
  Re-evaluate goals and technologies yearly by a systematic process, decide what to prototype and build next.

Federation

GENI grows by "gluing together" heterogeneous facilities over time



Goals: avoid technology "lock in," add new technologies as they mature, and potentially grow quickly by incorporating existing facilities into the overall "GENI ecosystem"

It's all about managing risks

The Central Goal of GENI Planning and Construction

We'll take it little by little. Those parts of GENI that are widely used will grow; those that aren't, won't get more funding. But it won't be impromptu or ad hoc – we will follow a well-defined, formal process throughout: spiral development.

I see. We are avoiding an "all or nothing" gamble – we don't try to specify all of GENI right now, then live with it for the next 20 years. Thank heavens!

GENI Engineering Conferences

Meet every 4 months to review progress together

- **GEC 3: July 21-23, 2008 in Palo Alto, open to all**
  - Reviews current GENI status, Working Group meetings
  - Also discuss GPO solicitation, how to submit a proposal, evaluation process & criteria, how much money, etc.
  - **Travel grants** for participant diversity (US academics only)
- Subsequent Meetings, open to all who fit in the room
  - Held at regular 4-month periods
  - Held on / near university campuses (volunteers?)
  - All GPO-funded teams required to participate
  - Systematic, open review of each Working Group status (all documents and prototypes / trials / etc.)
  - Also time for Working Groups to meet face-to-face
  - Results in prioritized list for next round of prototype funding areas (priorities decided by GSC and GPO)

GENI is a Huge Opportunity

- **GENI is an unbelievably exciting project for the community**
  - Our research community has changed the world profoundly. GENI opens up a space to do it again.
- **We believe the whole community will build GENI together**
  - Our vision is for a very lean, fast-moving GPO, with substantially all design and construction work performed by academic and industry research teams.
- **Community prototyping is now underway!**
  - within a GENI project framework that is open, transparent, and broadly inclusive.

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